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MAIZE DWARF MOSAIC VIRUS

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Maize dwarf mosaic is one of the most important and widely distributed virus diseases of corn (Zea mays L.) in the U.S.A. and is especially a concern to seed producers. It is found in 37 states of the continental U.S.A. and Hawaii. This disease caused severe yield losses in the early 1960's, particularly in dent corn (9). However, the crop losses varied greatly depending on the susceptibility of the corn genotype, virus strains, plant age and environmental factors. Maize dwarf mosaic virus (MDMV) was named by Williams and Alexander (9) and is closely related to sugarcane mosaic virus (SCMV) which has at least 13 strains (1). In 1966 MacKenzie and associates (5) described MDMV strains A and B on the basis that strain B does not infect Johnsongrass. Both MDMV strains A and B were reported from Florida in 1978 and 1979 (6).

SYMPTOMS: Considerable variation of mosaic pattern may be produced by MDMV in corn. During initial symptom development, light and dark green mottles are evident on leaves (Fig. 1). As the disease progresses, the alternating light and dark green mottles increase in intensity to form mosaics, flecks and rings on leaves. The mosaic pattern usually begins at the leaf base and may be irregular and diffuse. Mosaics produced by MDMV-A are often limited to the interveinal areas and so form stripes. Mosaic may also be evident on leaf sheaths and flag leaves of the ears. Plant stunting and poor ear fill may be associated with the mosaic symptom.

CAUSAL AGENT: MDMV particles are flexuous rods, typical of the potyvirus group measuring about 750 nm in length and 12-15 nm in diameter (7). Pinwheel inclusion bodies in infected tissue are often evident. MDMV-A causes systemic infection in corn, Johnsongrass and 'Atlas' sorghum [Sorghum bicolor (L.) Moench]. It does not infect wheat. In contrast, MDMV-B infects corn, causing local lesions, and may become systemic on 'Atlas' sorghum and other sorghum cultivars. Strain B does not infect Johnsongrass or wheat (3) but does infect St. Augustinegrass [Stenotaphrum secundatum (Walt.) Kuntze] in south Florida (6) and other species of Stenotaphrum.

HOST RANGE: The host range of MDMV is limited to the grass family. Of 66 grass genera tested from the U.S.A., 44 contained one or more susceptible species. Nearly 250 grass species including species of Cynodon, Paspalum, and Pennisetum have been reported as hosts of MDMV; 243 species are susceptible to both MDMVA and B, 38 grasses are susceptible to MDMV-B (8).

Fig. 1. Field corn leaves infected with maize dwarf mosaic virus showing light and dark green mottles and stripes.

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DISEASE DEVELOPMENT: Seed transmission of MDMV (up to 0.5%) results in a high disease incidence in maturing plants (2). MDMV is also readily transmissible by aphids in a nonpersistent manner which means that both virus acquisition and inoculation by aphids can occur in a few seconds. At least 25 species of aphids have been reported to be vectors (4). The transmission efficiency varies greatly depending upon aphid species, environmental conditions, virus strains and host plants. The virus can survive in perennial grasses or in the seed of annual or perennial grasses which represent important sources for both MDMV and the aphids that transmit it. Long distance movement of the viruliferous aphids in low level wind jet streams can also be an important factor in virus spread. The aphid species known to be efficient vectors of MDMV are: Schizaphis graninum (Rondani), Aphis maidiradicis Forbes, A. craccivora Koch, A. fabae Scopoli, A. gossypii Glover, Hyalopterus atriplicis (L.), **Acyrthosiphon** pisum (Harris), Myzus persicae (Sulzer), Macrosiphum avenae (F), Rhopalomyzus poae (Gillette) and Rhopalosiphum padi (L.) (4).

CONTROL: Control measures include the use of resistant varieties, the application of aphicides and the elimination of Johnsongrass in the vicinity of corn plantings. The use of cross protection and biological control of the vectors need to be explored.

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